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On the Cuculliine Moths of *Hyalobole* (Lepidoptera, Noctuidae), with Description of a New Species from Taiwan¹⁾

By

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Abstract The monotypic noctuid genus, *Hyalobole* WARREN, 1911, (type species: *Hyalobole orthosioides* WARREN, 1911) has hitherto been known only from Darjeeling, East Himalaya. The following two known species of *Agrochola* are transferred to *Hyalobole*: *H. phaeosoma* (HAMPSON, 1906), **comb. nov.**, from West Himalaya, and *H. albimacula* (KONONENKO, 1978), **comb. nov.**, from the Maritime Territory of Siberia. Redescriptions and collecting records of the three known species are given, and a new species, *Hyalobole changae*, is described from Taiwan.

The genus *Hyalobole* was erected by WARREN (1911) for a curious cuculliine species, *Hyalobole orthosioides* WARREN, 1911, from Darjeeling, eastern Himalaya, and later he illustrated this moth in colour (WARREN, 1913). In the description of this genus, he stressed the unique feature in the male hindwing as follows: "Hindwing with veins 6, 7 stalked; the discocellular is acutely angled inwards in the middle, the lower arm being long and oblique; the lower half of cell below discal fold is hyaline throughout, ending in the shape of a wedge (in the ♂). This peculiarity of structure is found also in the genus *Tiracola* MOORE [Hadeninae]."

In 1979 and 1981, I had opportunities to participate in zoogeographical expeditions to the Himalayas made by the National Science Museum, Tokyo, and collected *Hyalobole orthosioides* and some allied moths, one of which I was able to identify with *Amathes phaeosoma* HAMPSON, 1906. On the other hand, KONONENKO (1978) described an interesting autumnal noctuid moth under the genus *Agrochola*, namely *A. albimacula*, from the Maritime Territory of Russia. When Dr. KONONENKO visited our museum in 1989, we were of the same opinion that *H. orthosioides* and *A. albimacula* were closely related, though the male hindwing of the latter has no hyaline part in the cell. Besides the three related species, I collected another rather small species in Taiwan in the spring of 1972, though they were very worn. In January of 1992, I collected a long series of this moth, and found that it was very similar to *Amathes phaeosoma* not only in the genitalia but also in the wing maculation. Although the hyaline part of the hindwing is found only in the type species, *H. orthosioides*, the

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four species mentioned above are considered closely related by the similarity of their genitalic features, that is, the weakly sclerotized valva is rather short and round in apical portion, with a series of fine coronal spines, and the harpe and ampulla are present. In this paper, I will redescribe the three known species under the genus *Hyalobole*, and describe the species from Taiwan as being new.

Before going further, I wish to express my hearty thanks to Ms. Yu-Cheng CHANG and Mr. Yi-Bin FAN, Taiwan Forestry Research Institute, Taipei, for their kind aid in field surveys, to Professor Yau-I CHU and Mr. Chiun-Chen KO, National Taiwan University, for their kind arrangement for our expedition made by the Zoological Department of the National Science Museum, Tokyo. My special thanks are also due to Dr. Shun-Ichi UÉNO, National Science Museum, Tokyo, for reading and criticizing the manuscript of this paper, to Dr. V.S. KONONENKO, Institute of Biology and Pedology, Vladivostok, for the discussion on this group and the material, to Mr. Shigero SUGI, Tokyo, for his valuable advice and constant encouragement, and to Mr. Kiyoshi HORIE and Dr. Hideki KOBAYASHI, Tokyo, Mr. Tatsuya TANABE, Yôrô, Dr. Tsukane YAMASAKI, Tokyo Metropolitan University, Hachiôji, and Professor Yoshiaki NISHIKAWA, Ottemongakuin University, Ibaraki, for the material used in this study.

Hyalobole orthosiooides WARREN

(Figs. 1-2)

Hyalobole orthosiooides WARREN, 1911, Novit. zool., 18: 142; WARREN, 1913, in SEITZ, Macrolepid. World, 11: 116, pl. 14, row i.

♂ & ♀. Length of forewing: 15-17 mm; expanse: 28-32 mm.

Ground colour of head, thorax and the upperside of forewing ochreous orange, dusted with dark scales. On the upperside of forewing, lines brownish orange; basal part and middle of dorsum darkened in male, outer area from postmedial line darkened in both the sexes. Upperside of male hindwing brownish orange, costal area paler, cilia ochreous orange, lower half of the cell hyaline; in female hindwing, ground colour much paler, hyaline portion absent in the cell.

Male genitalia (Fig. 15). Uncus long, slender, apex pointed, slightly hooked. Tegumen rather broad, peniculus well developed, round. Vinculum U-shaped. Valva curved, apical portion broad, rounded, with a series of fine coronal spines; harpe sinuate, with rounded apex; ampulla acute, pointed at apex; dorsal surface of valva with a membranous part. Juxta pear-shaped. Aedeagus slightly curved; everted vesica with a membranous projection ventrally, a mass of curved stout spines in distal portion.

Female genitalia (Fig. 19). Ovipositor very long. Papillae anales rather membranous, with long bristles, apophyses posteriores long, well sclerotized, slender, broadened in apical 1/4; 8th abdominal segment long, apophyses anteriores about 1/4 as long as apophyses posteriores, sclerotized, slender; ostium border well defined, straight. Ductus bursae moderate, as long as 8th segment. Corpus bursae simple, membranous,

twice as long as ductus bursae, cervix bursae as large as corpus bursae, furrowed, ductus seminalis arising from the top of cervix bursae.

Material examined. Central Nepal: Deolari 2,800 m, Ghorapani, Parabt, Gandaki, 1 ♂, 15. X. 1981, M. OWADA leg.; Phedi 2,350 m, Parbat, Gandaki, 3 ♂, 18. X. 1981, M. OWADA leg.; Modikhola 2,670 m, Parbat, Gandaki, 2 ♂, 19. X. 1981, M. OWADA leg. East Nepal: Thodung, 3,100 m, Ramechhap, Janakpur, 5 ♂ 2 ♀, 14. X. 1979, M. OWADA leg.; Sete 2,600 m, Solukhumbu, Sagarmatha, 6 ♂ 1 ♀, 12. X. 1979, M. OWADA leg.; Junbesi 2,670 m, Solukhumbu, Sagarmatha, 4 ♂ 5 ♀, 10–11. X. 1979, M. OWADA leg.; Ringmo 2,780 m, Solukhumbu, Sagarmatha, 13 ♂ 1 ♀, 9. X. 1979, M. OWADA leg.; Poyan 2,780 m, Solukhumbu, Sagarmatha, 68 ♂, 6. X. 1979, M. OWADA leg.; Nangbug 2,550 m, Solukhumbu, Sagarmatha, 6 ♂, 5. X. 1979, M. OWADA leg.; Monjo 2,800 m, Solukhumbu, Sagarmatha, 9 ♂, 4. X. 1979, M. OWADA leg.; Chauki 2,700 m, Terhathum, Kosi, 1 ♂ 2 ♀, 30. X. 1979, M. OWADA leg. India, West Bengal: Gairbas 2,550 m, Darjeeling, 3 ♂, 5. XI. 1981, M. OWADA leg.; Tiger Hill 2,570 m, Darjeeling, 4 ♂, 8. XI. 1981, M. OWADA leg.

Distribution. India (West Bengal), Central and East Nepal (new record).

Notes. Judging from the original descriptions of the genus and species (WARREN, 1911) and from the colour illustration by WARREN (1913), the identification of this species is doubtless. The syntypes (2 ♂) were collected at Darjeeling by PILCHER without date. Although WARREN (1911) supposed that the collecting date was the same as that for examples of “*Elwesia*” species [April and May, 1889], this species is an autumnal flyer.

Hyalobole albimacula (KONONENKO), comb. nov.

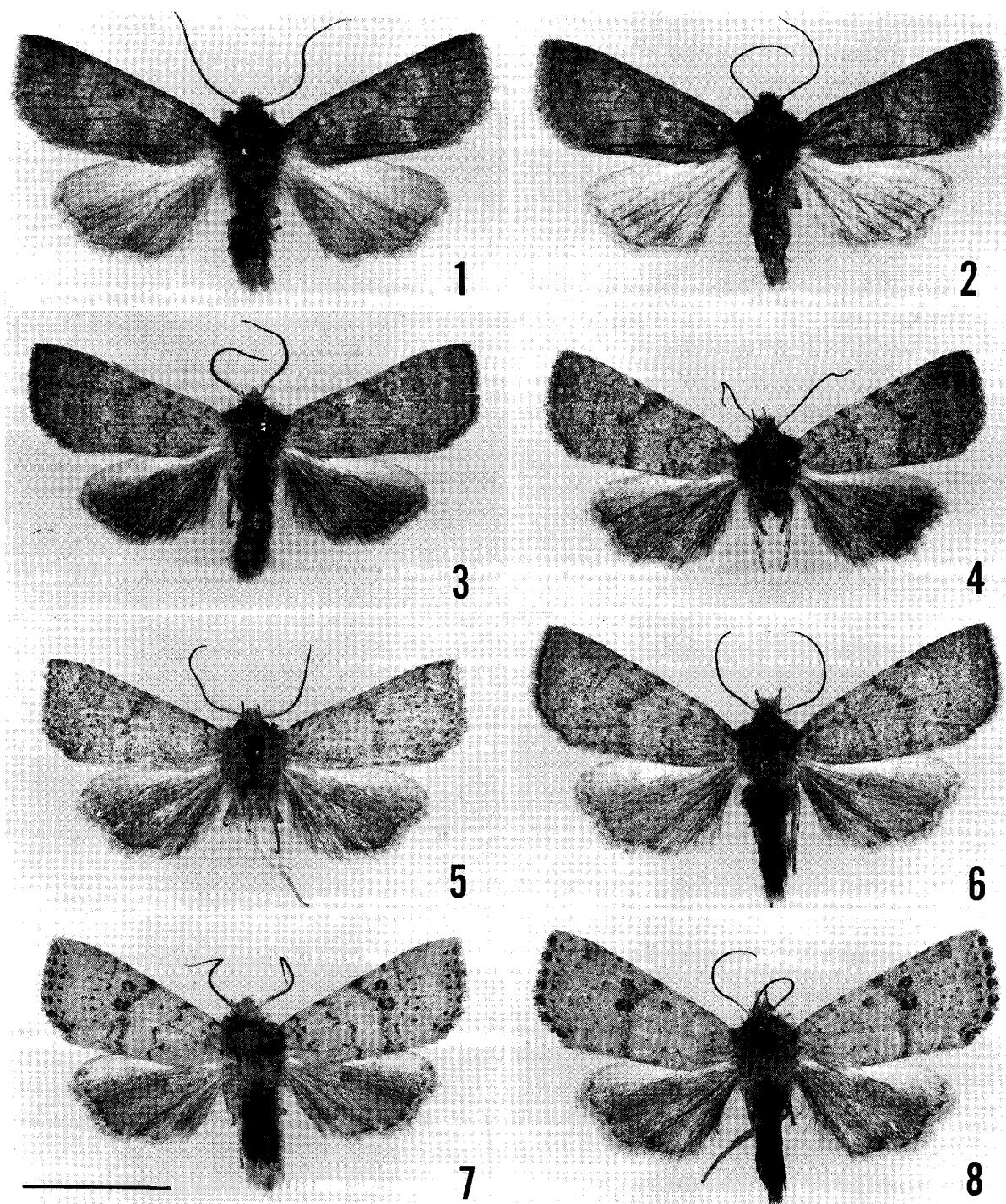
(Fig. 9)

Agrochola albimacula KONONENKO, 1978, Ent. Obozr., 57: 894, figs. 6–7, ♂ & ♀ genitalia; KORSÓS & RONKAY, 1988, Folia ent. hung., 49: 212; RONKAY & PARK, 1993, Insecta koreana, 10: 62.

♂. Length of forewing: 16 mm; expanse: 31–32 mm [from original description with females].

Ground colour of head, thorax and the upperside of forewing pale pink, tinged with ochre; abdomen brown, with pale ochreous anal tuft. On the upperside of forewing, lines brownish grey, faint; inner margins of orbicular and reniform stigmata edged with white; cilia brownish grey. Upperside of hindwing pale yellow, anal portion darkened; discocellular mark dark grey, dark grey postmedial line traceable in lower half of wing; cilia pale yellow.

Male genitalia (Fig. 16). Very similar to those of the preceding species. Uncus more strongly hooked at apex. Peniculus more developed. Vinculum shorter. Valva longer, more heavily sclerotized; harpe straight, arising beyond the middle of valva, while in *orthosiooides* it is curved and arises before the middle of valva; ampulla short, with wide basal part. Juxta with a heavily sclerotized projection distally. Aedeagus straight, with a mass of long sclerotized spines in dorso-distal portion; everted vesica



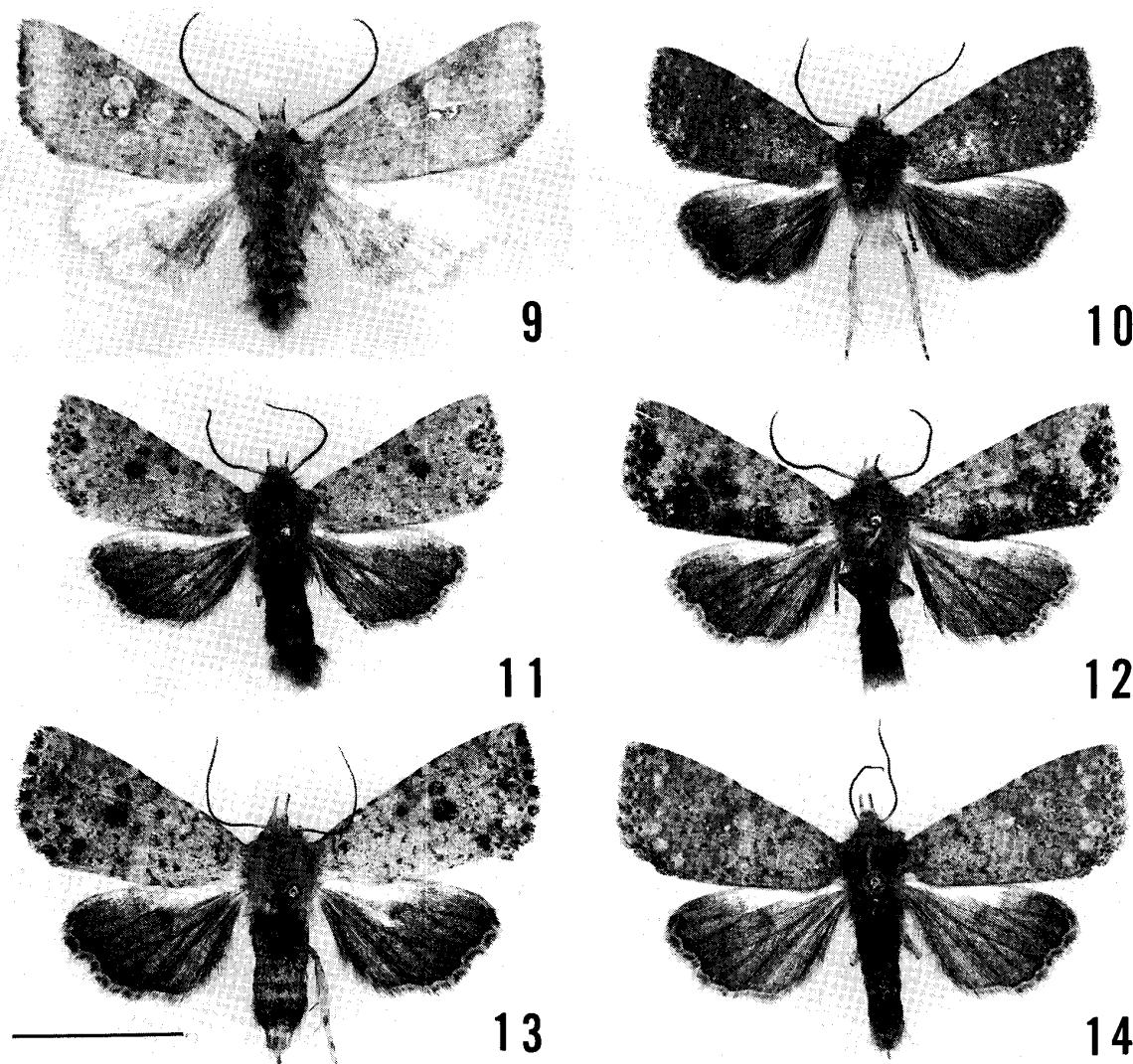
Figs. 1-8. *Hyalobole* spp. from the Himalayas. — 1, *H. orthosiodes* WARREN, ♂, Monjo, E. Nepal, genit. slide no. NSMT 2295 ♂; 2, ditto, ♀, Thodung, E. Nepal, genit. slide no. NSMT 2296 ♀. — 3, *H. phaeosoma* (HAMPSON), ♂, Neurgar, W. Nepal; 4, ditto, ♀, Dolangsa, E. Nepal, genit. slide no. NSMT 1728 ♀; 5, ditto, ♂, Dolangsa, E. Nepal, genit. slide no. NSMT 1727 ♂; 6, ditto, ♀, Jaljale, W. Nepal; 7, ditto, ♂, Bhulbhule, W. Nepal, genit. slide no. NSMT 2291 ♂; 8, ditto, ♀, Bhulbhule, W. Nepal, genit. slide no. NSMT 2292 ♀. Scale: ca. 10 mm.

with a mass of slender straight spines, which are curved and stouter in *orthosiooides*.

Material examined. Paratypes of *Agrochola albimacula*: Russian Far East, Southern Maritime Territory, Eapovednik, Kedrovaya Pad, Dorinniy Shirokolistvennyi, 1 ♂, 23. IX. 1976, 1 ♂, 30. IX. 1976, genit. slide no. NSMT 2219 ♂.

Distribution. Russian Far East (Maritime Territory), Korea.

Notes. Although the cell of male hindwing is not hyaline, this species is doubtlessly a member of the genus *Hyalobole* because of the similarity of the genitalic features. Recently this species was recorded from northern Korea (KORSÓS & RONKAY, 1988; RONKAY & PARK, 1993).



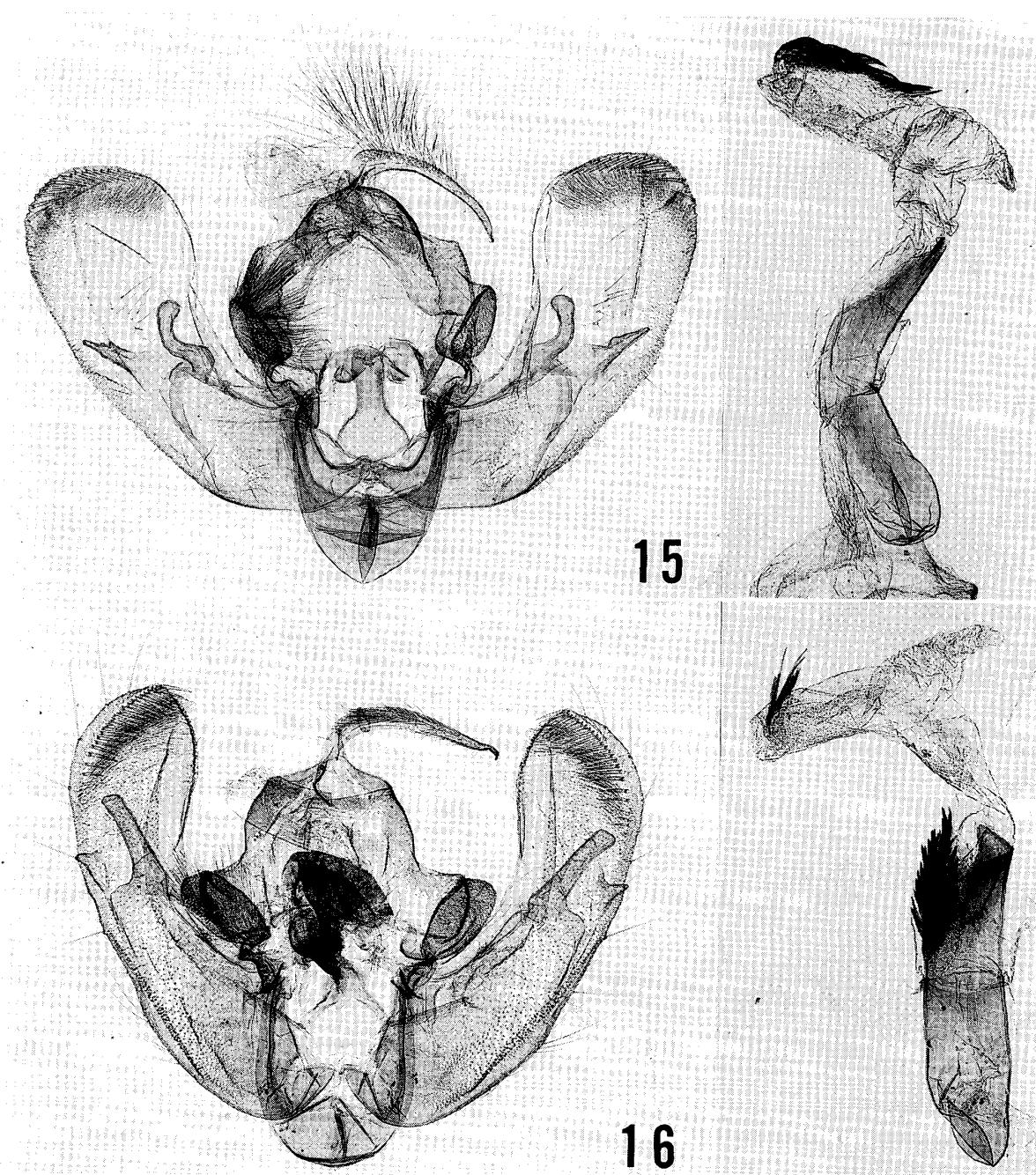
Figs. 9-14. *Hyalobole* spp. from East Asia. — 9, *H. albimacula* (KONONENKO), ♂, paratype, Maritime Territory of Russia. — 10, *H. changae*, sp. nov., ♂, holotype, Taiwan; 11, ditto, ♂, paratype, Suleng, Taoyuan, genit. slide no. NSMT 2293 ♂; 12, ditto, ♂, paratype, Anmashan, Taichung, genit. slide no. NSMT 2289 ♂; 13, ditto, ♀, paratype, Anmashan, Taichung, genit. slide no. NSMT 2294 ♀; 14, ditto, ♀, paratype, Anmashan, Taichung, genit. slide no. NSMT 2290 ♀. Scale: ca. 10 mm.

Hyalobole changae sp. nov.

(Figs. 10-14)

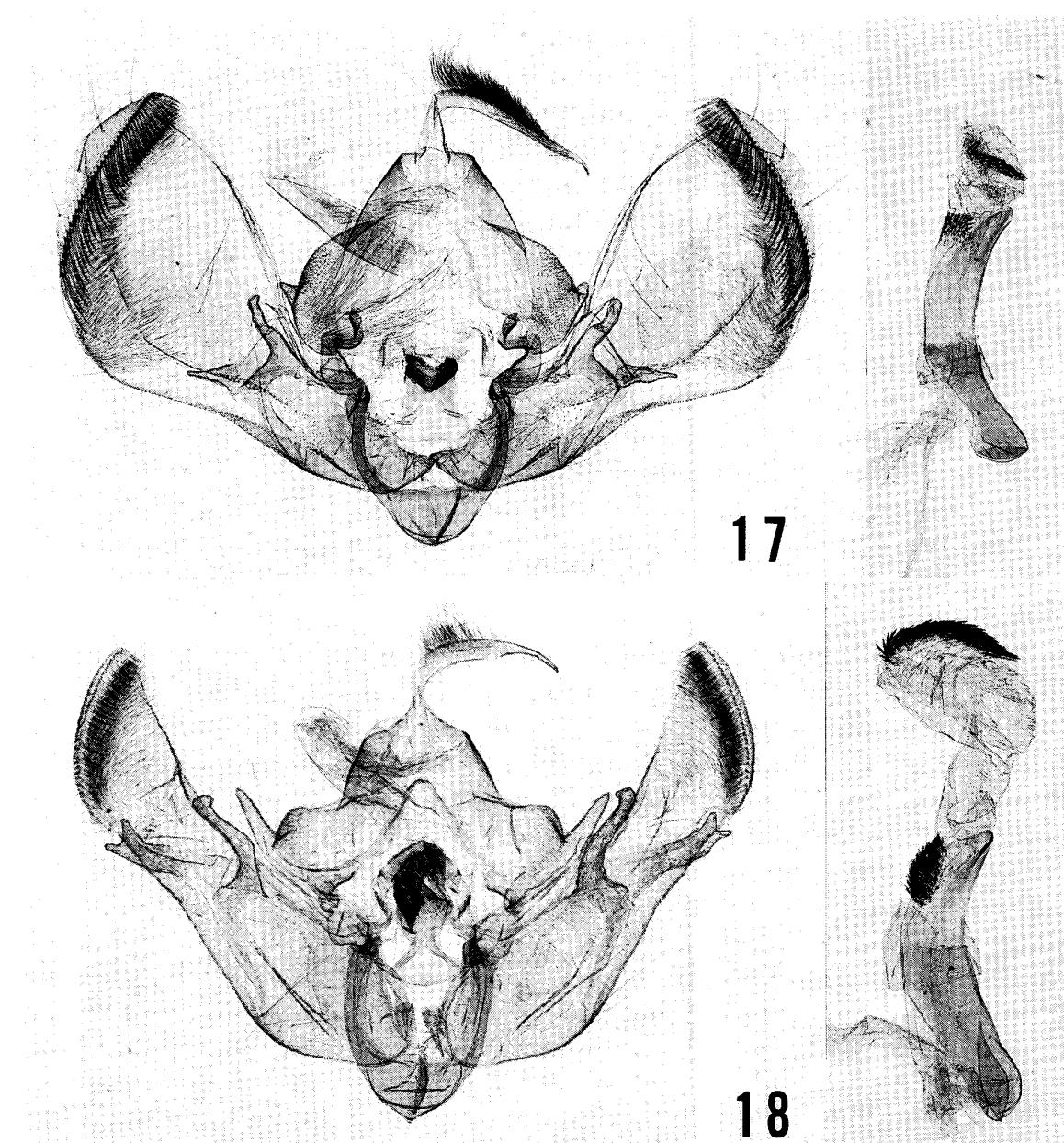
♂ & ♀. Length of forewing: 11-15 mm; expanse: 21-28 mm.

Ground colour of head, thorax and the upperside of forewing greyish ochre,



Figs. 15-16. Male genitalia of *Hyalobole*. — 15, *H. orthosiooides* WARREN, Monjo, E. Nepal, genit. slide no. NSMT 2295 ♂. — 16. *H. albimacula* (KONONENKO), Maritime Territory of Russia, genit. slide no. NSMT 2219 ♂.

dusted with dark scales; abdomen blackish brown, with pale anal portion. On the upperside of forewing, lines dark brown, transverse lines faint, mostly represented by small dots; uniformly marked form (Figs. 10, 14) with small white points in reniform stigma; strongly marked form (Figs. 11, 13) with black orbicular and reniform stigmas; exceptional form (Fig. 12) with blackish portions on dorsal and terminal margins. Upperside of hindwing blackish brown, costal margin and cilia pale greyish ochre.



Figs. 17-18. Male genitalia of *Hyalobole*. — 17, *H. changae*, sp. nov., paratype, Anmashan, Taichung, genit. slide no. NSMT 2283 ♂, — 18, *H. phaeosoma* (HAMPSON), Bhulbhule, W. Nepal, genit. slide no. NSMT 2291 ♂.

Male genitalia (Fig. 17). Similar to those of *H. orthosiooides* and *H. albimacula*. Uncus not so strongly hooked as in *albimacula*. Peniculus markedly developed, longer than a half of tegumen, with a short blunt projection at middle. Vinculum as in *albimacula*. Valva narrowed in basal portion, markedly broadened distally; harpe slightly curved, arising from basal 1/3 of valva, ampulla acute, as in *orthosiooides*; coronal spines longer and more in number than those of the others. Juxta with a sclerotized projection which is smaller than in *albimacula*. Aedeagus small, almost a half as large as those in the others, a mass of very short spines in dorso-distal portion; everted vesica with a mass of much shorter spines.

Female genitalia (Fig. 20). Very similar to those of *H. orthosiooides*. Ovipositor a little longer. Distal portion of apophyses anteriores markedly broadened as in apophyses posteriores, while in *orthosiooides* it is not broadened. Ostium border V-shaped. Ductus bursae a little shorter than in *orthosiooides*. Corpus bursae very long and slender, almost as long as ovipositor, membranous; cervix bursae very small.

Type series. Holotype ♂, Lalashan 1,500 m, Taoyuan, Taiwan, 20–22. I. 1992, M. OWADA leg., genit. slide no. NSMT 2251 ♂, in National Science Museum, Tokyo. Paratypes: Same data as holotype, 8 ♂ 7 ♀; Suleng 1,000 m, Fuhsing, Taoyuan, 2 ♂, 23. I. 1992, M. OWADA leg.; same locality 1,200 m, 4 ♂, 25. I. 1992, M. OWADA leg.; Anmashan 2,000–2,300 m, Tahsuehshan Mts., Taichung, 27 ♂ 23 ♀, 11–14. I. 1992, K. HORIE, H. KOBAYASHI & M. OWADA leg.; Lishan, Taichung, 1 ♀, 7. III. 1976, T. TANABE leg.; Tienchi 2,860 m, Mt. Nenkaoshan, Nantou, 1 ♂, 26. X. 1989, T. YAMASAKI & Y. NISHIKAWA leg.; Lushan Spa, Nantou, 1 ♂ 1 ♀, 19–21. III. 1972, M. OWADA leg.; Fenchihu, Chiayi, 1 ♂, 27–28. III. 1972, M. OWADA leg.; Alishan, Chiayi, 1 ♂, 23–26. III. 1972, M. OWADA leg.

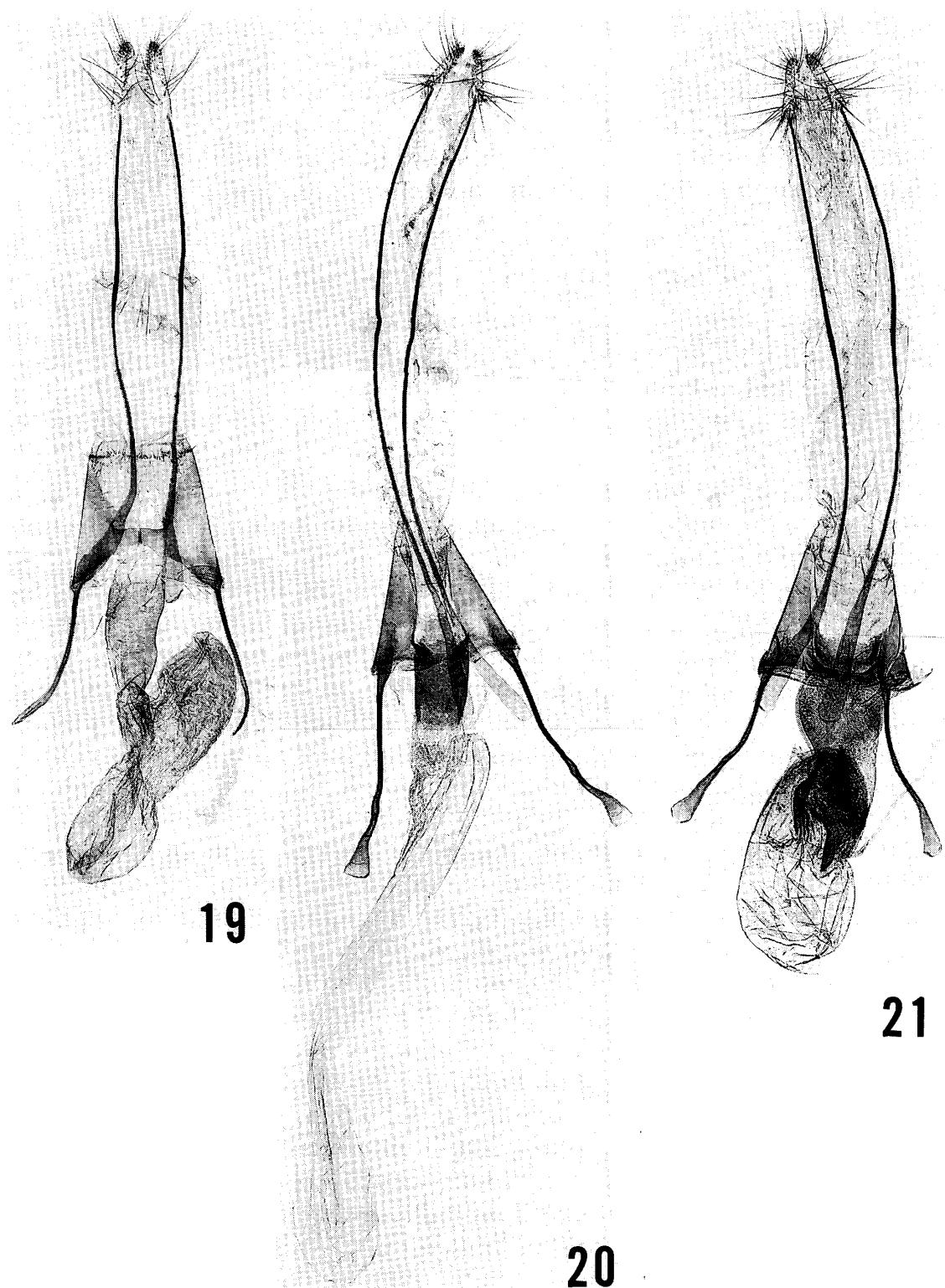
Distribution. Taiwan.

Notes. From the characteristics of the genitalia, this species is considered closely related to the preceding two species. On the other hand, the ground colour of this species is quite different from those in the others, that is, greyish ochre in *changae*, ochreous orange in *orthosiooides*, and pale pink tinged with ochre in *albimacula*. It is very interesting that the ground colour of some cuculliine moths is tinged with red, orange or yellow, especially in autumnal and winter flyers, for example, some of *Eupsilia*, female of *Agrochola evelina*, some of *Conistra*, *Dasicampa*, *Xanthia*, *Jodia*, some of *Telorta*, etc. It can be surmised that some ecological factors, e.g., colour of dead leaves, may cause to change their coloration, and such coloration does not reflect their relationship. The common Himalayan species “*Xanthia*” *melonina* (BUTLER, 1889)²⁾ has fine orange yellow ground colour, and is very similar to European *X. citrago* (LINNAEUS, 1758) and Japanese *X. japonago* (WILEMAN et WEST, 1929) in the wing color-

2) This species was described and illustrated by BUTLER (1889, p. 57, pl. 128, fig. 7), and then also illustrated by HAMPSION (1906, pl. 107, fig. 18) and WARREN (1913, pl. 14, row i), respectively, and the male genitalia of the lectotype were illustrated by HACKER and RONKAY (1992, p. 217, fig. 32 c), in the generic name with quotation marks as “*Xanthia*”. YOSHIMOTO (1993, pl. 62, fig. 15) illustrated a clearly different species under the name of *Xanthia melonina*.

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Figs. 19-21. Female genitalia of *Hyalobole*. — 19, *H. orthosiooides* WARREN, Thodung, E. Nepal, genit. slide no. NSMT 2296 ♀. — 20, *H. changae*, sp. nov., paratype, Anmashan, Taichung, genit. slide no. NSMT 2290 ♀. — 21, *H. phaeosoma* (HAMPSON), Bhulbhule, W. Nepal, genit. slide no. NSMT 2290 ♀.

ation, but the genitalia are rather similar to those of Himalayan *Dichoniopsis leucosticta* (MOORE, 1882) and Japanese *Antivaleria viridimacula* (GRAESER, [1889]), and the ground colour of the latter two is dark brown to grey, with green maculation.

It is a great pleasure for me to name this pretty species after Ms. Yu-Cheng CHANG, Taiwan Forestry Research Institute, Taipei, who just retired from her official duty and is still working on the life history and biology of moths in Taiwan.

***Hyalobole phaeosoma* (HAMPSON), comb. nov.**

(Figs. 3-8)

Amathes phaeosoma HAMPSON, 1906, Cat. Lepid. Phalaenae Br. Mus., 6: 488, pl. 107, fig. 5; Warren, 1913, in SEITZ, Macrolepid. World, 11: 114, pl. 14, row h.

Agrochola phaeosoma: POOLE, 1989, Lepid. Cat., (N. Ser.), (118): 41; YOSHIMOTO, 1992, Tinea, 13 (Suppl. 2): 58, pl. 15, fig. 13.

♂ & ♀. Length of forewing: 13-16 mm; expanse: 24-31 mm.

Wing maculation and coloration almost the same as in the preceding species except for the ground colour much paler.

Male genitalia (Fig. 18). Very similar to those of *H. changae*. Peniculus with a much longer blunt projection at middle. Valva slightly constricted at middle; sacculus more developed and cucullus less developed; harpe sinuate, longer; ampulla long, with bifurcate apex. Aedeagus larger, spines in dorso-distal portion longer; mass of spines in distal portion of everted vesica larger, the spines markedly longer.

Female genitalia (Fig. 21). Very similar to those of *H. changae*. Ostium border U-shaped. Ductus bursae broad. Corpus bursae very short, with a rather sclerotized portion.

Material examined. West Nepal: Ghughuti 2,660 m, Jumla, Karnali, 1 ♀, 21. IX. 1981, M. OWADA leg.; Naurgar 2,800 m, Jumla, Karnali, 5 ♂ 4 ♀, 22. IX. 1981, M. OWADA leg.; Bhulbhule 3,270 m, Jumla, Karnali, 14 ♂ 11 ♀, 23. IX. 1981, M. OWADA leg.; Jhari 2,550 m, Jumla, Karnali, 1 ♂, 24. IX. 1981, M. OWADA leg.; Chuchumara Danda 3,600 m, Jumla, Karnali, 16 ♂ 14 ♀, 27. IX. 1981, M. OWADA leg.; Jillya 2,600 m, Jumla, Karnali, 11 ♂ 2 ♀, 29. IX. 1981, M. OWADA leg.; Jaljale 3,420 m, Jumla, Karnali, 7 ♂ 81 ♀, 30. IX. 1981, M. OWADA leg.; Jumla 2,440 m, Karnali, 1 ♀, 1. X. 1981, M. OWADA leg.; Rara Lake 2,990 m, Mugu, Karnali, 3 ♂ 2 ♀, 25-26. IX. 1981, M. OWADA leg. East Nepal: Dolangsa 2,600 m, Sindhu, Bagmati, 2 ♂ 2 ♀, 11. XI. 1979, M. OWADA leg.; Thodung 3,100 m, Ramechhap, Janakpur, 1 ♂, 14. X. 1979, M. OWADA leg.; Junbesi 2,670 m, Solukhumbu, Sagarmatha, 2 ♂, 10-11. X. 1979, M. OWADA leg. India, West Bengal: Sandakphu 3,620 m, Darjeeling, 2 ♀, 3-4. XI. 1981, M. OWADA leg.; Gairibas 2,550 m, Darjeeling, 1 ♂ 5 ♀, 5. XI. 1981, M. OWADA leg.; Tiger Hill 2,570 m, Darjeeling, 1 ♀, 8. XI. 1981, M. OWADA leg.

Distribution. India (Himachal Pradesh, West Bengal), Nepal.

Notes. This species is very common in Nepal Himalaya, and variable in coloration like *H. changae*. WARREN (1911) described two similar moths from the same

source as *Hyalobole orthosioides*, the PILCHER collection, under the genus *Elwesia* HAMPSON, 1894, namely *E. nigripalpis* and *E. pallida*, and illustrated them in colour (WARREN, 1913). As was pointed out in the notes for *Hyalobole orthosioides*, the collecting season for the two moths might be autumn. Judging from the original descriptions and the colour illustrations, it is possible that they are varieties of *H. phaeosoma*.

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